

# Branchial apparatus Pharyngeal Arches

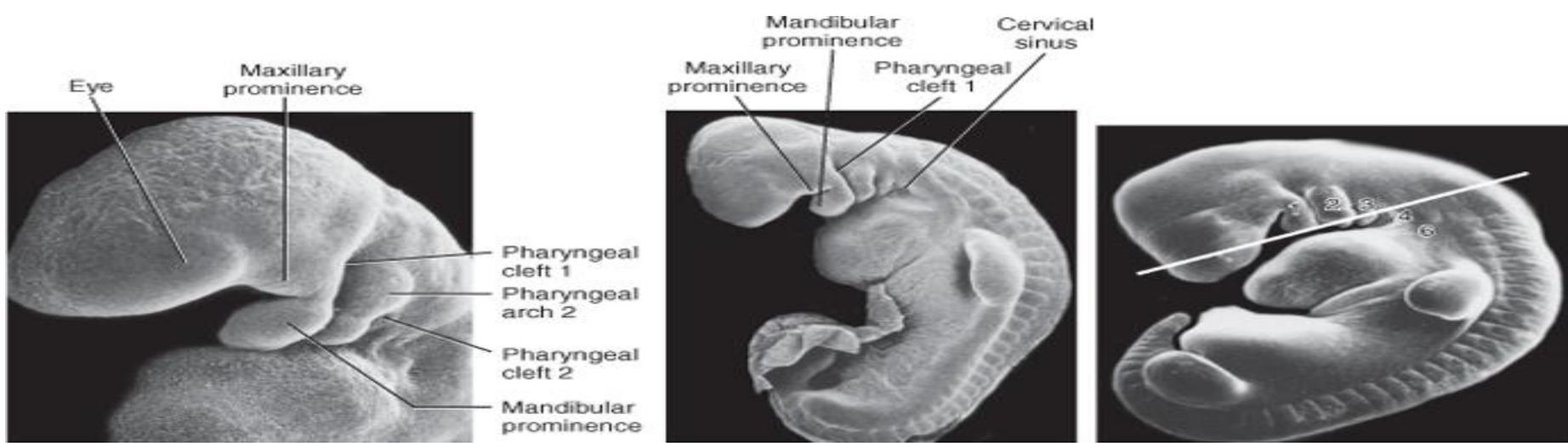
By

**ASS. Prof. Dr / Rasha Abdelaziz Abd Ellatif**  
**Assosiate professor of Anatomy and Embryology**

# Lecture ILOS & Objectives:

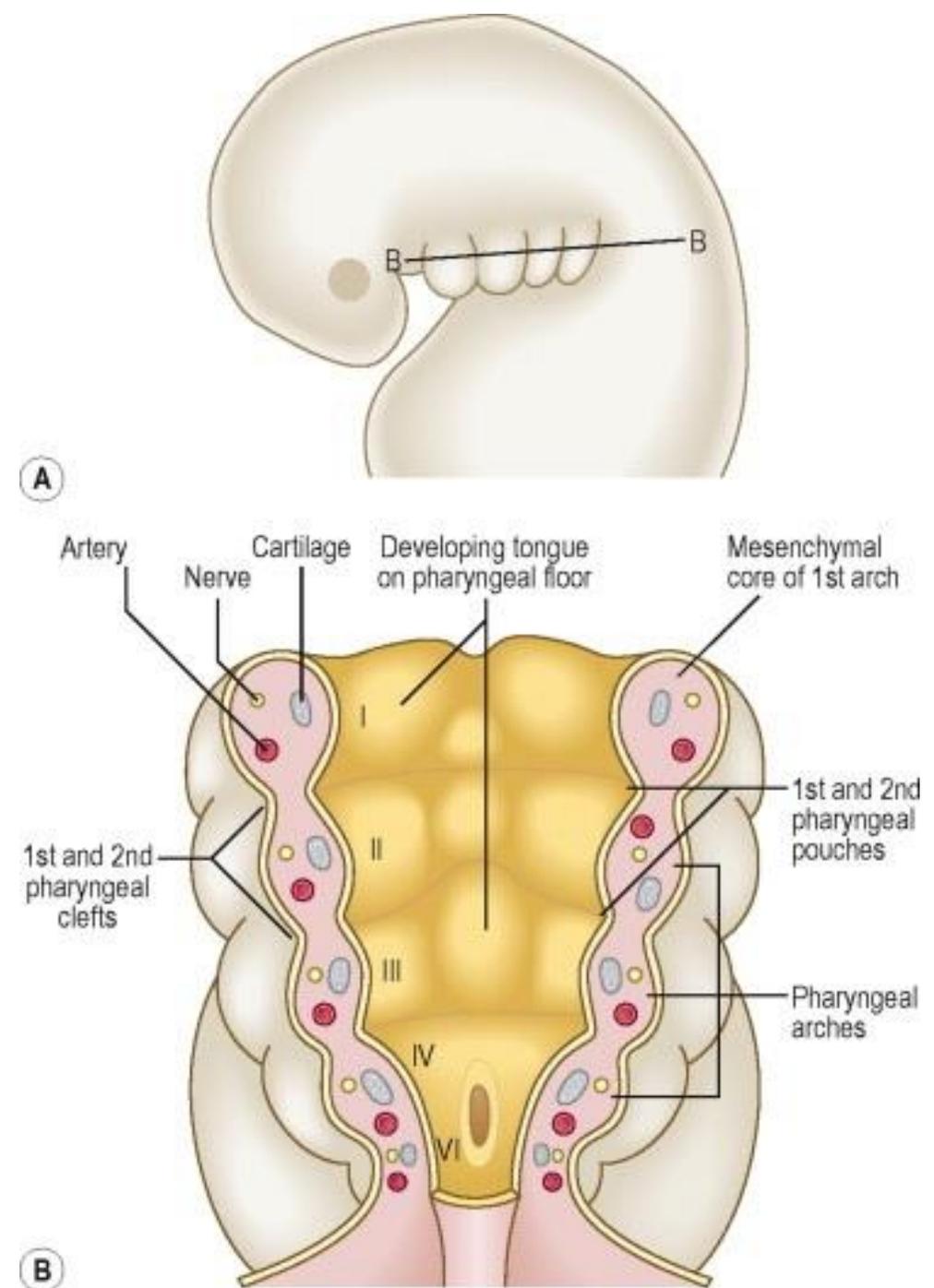
- **By the end of this lecture the student should be able to:**
- **Understand the formation of pharyngeal arches**
- **Identify skeletal derivatives of each pharyngeal arch**
- **Identify the muscles derived from each pharyngeal arch**
- **Understand the fate of pharyngeal pouches**
- **Outline the fate of pharyngeal clefts**

# Development of pharyngeal arches



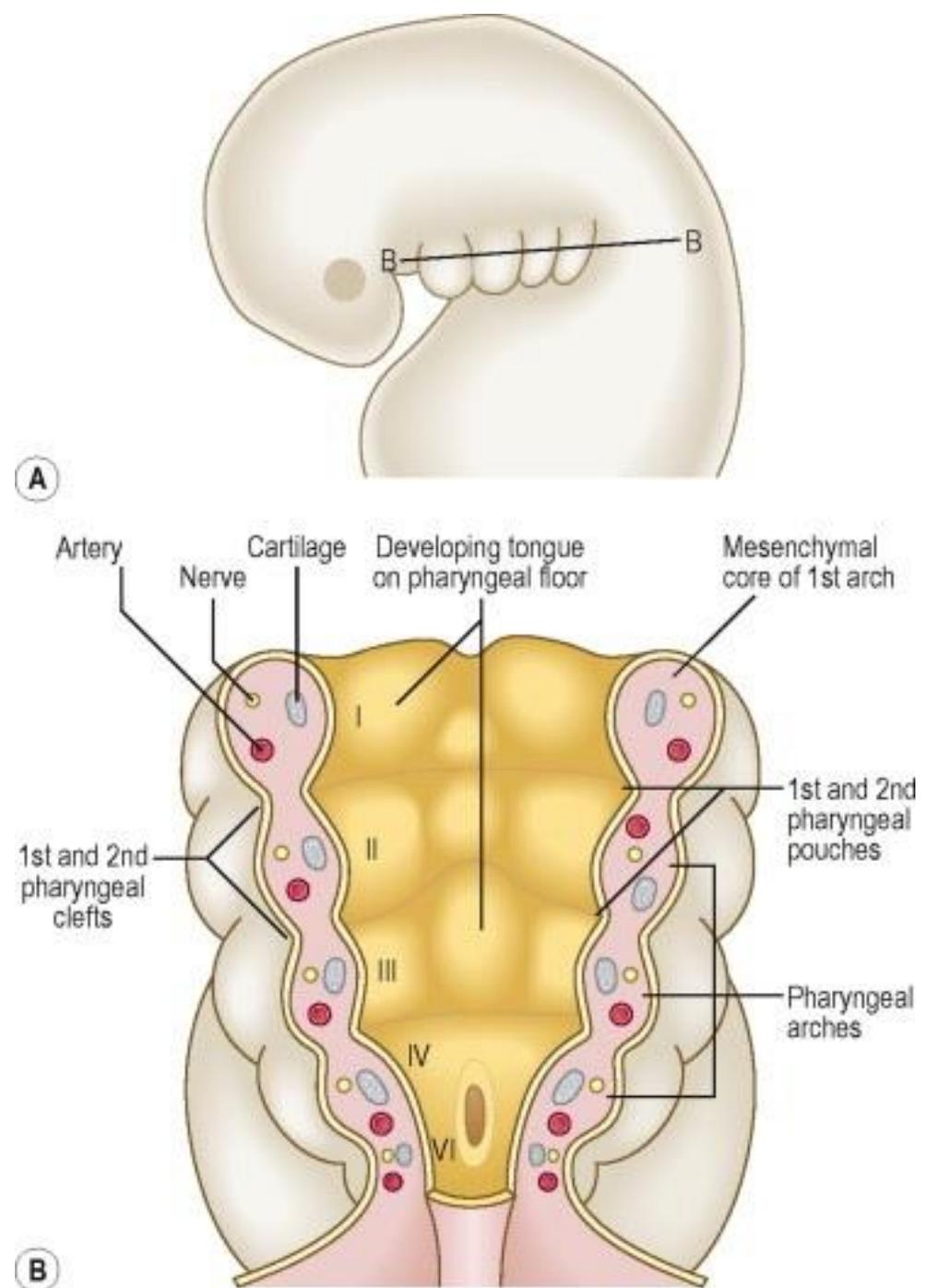
- **4 th week of intrauterine life of embryo**, the neck is not yet formed, where the head swelling is followed by the cardiac swelling and both are only separated by the depression of stomodeum (future mouth).
- **5 th week**, the middle mesodermal layer, on each side, shows an anteroposterior segmentation into 6 segments called pharyngeal or branchial arches.

- Each pharyngeal arch consists of a core of mesenchymal tissue (derived from neural crest cells), covered on the outside by ectoderm and on the inside by endoderm.
- Each arch has its own blood and nerve supply.



➤ Externally, the arches are separated by ectodermal grooves called the branchial (pharyngeal) clefts. These clefts are enumerated 1<sup>st</sup> to 4<sup>th</sup> in a craniocaudal direction.

➤ Internally, the arches are separated by endodermal grooves known as the pharyngeal pouches.

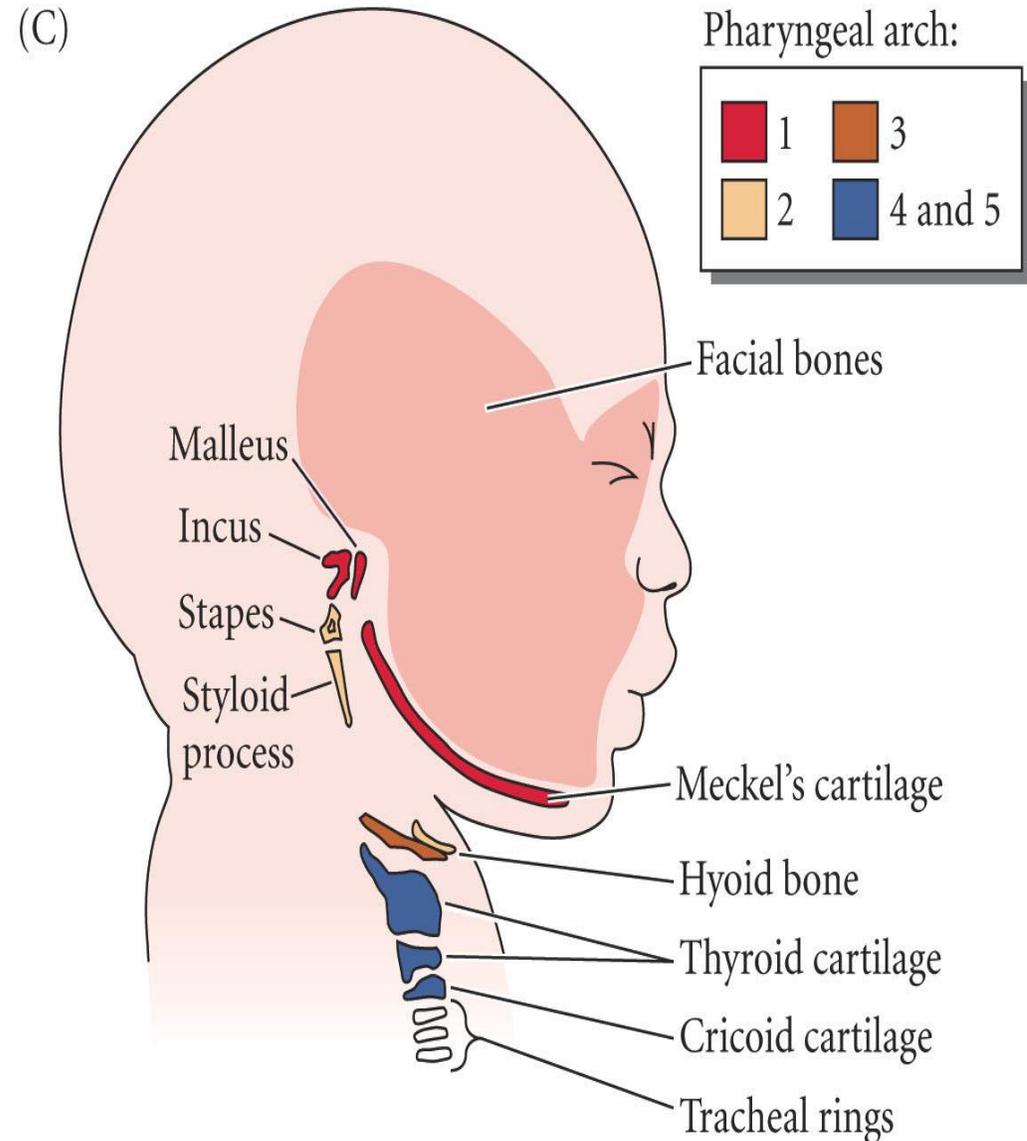


# Mesodermal Derivatives of the pharyngeal arches

First pharyngeal arch

➤ The skeletal derivatives of the **first arch** are:

- 1. Malleus.
- 2. Incus
- 3. Sphenomandibular ligament.
- 4. Mandible by the mesodermal condensation around Meckel's cartilage.

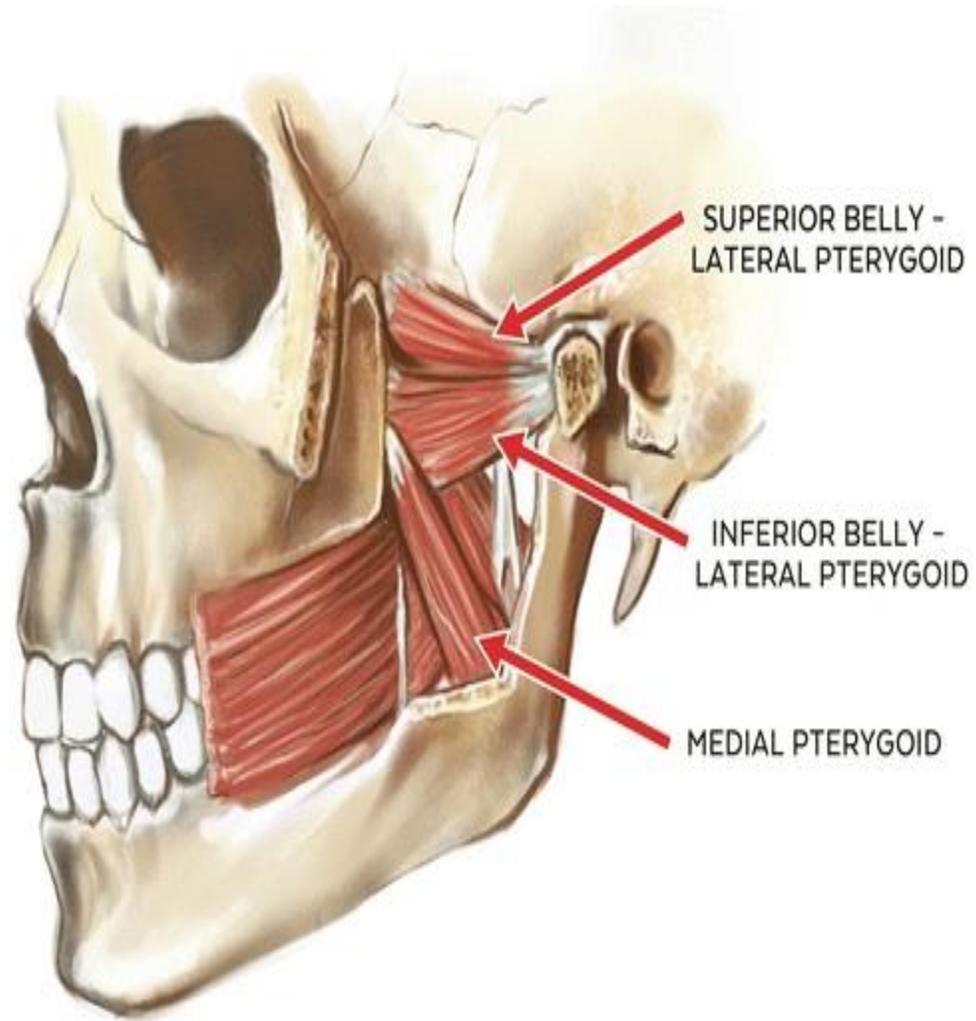
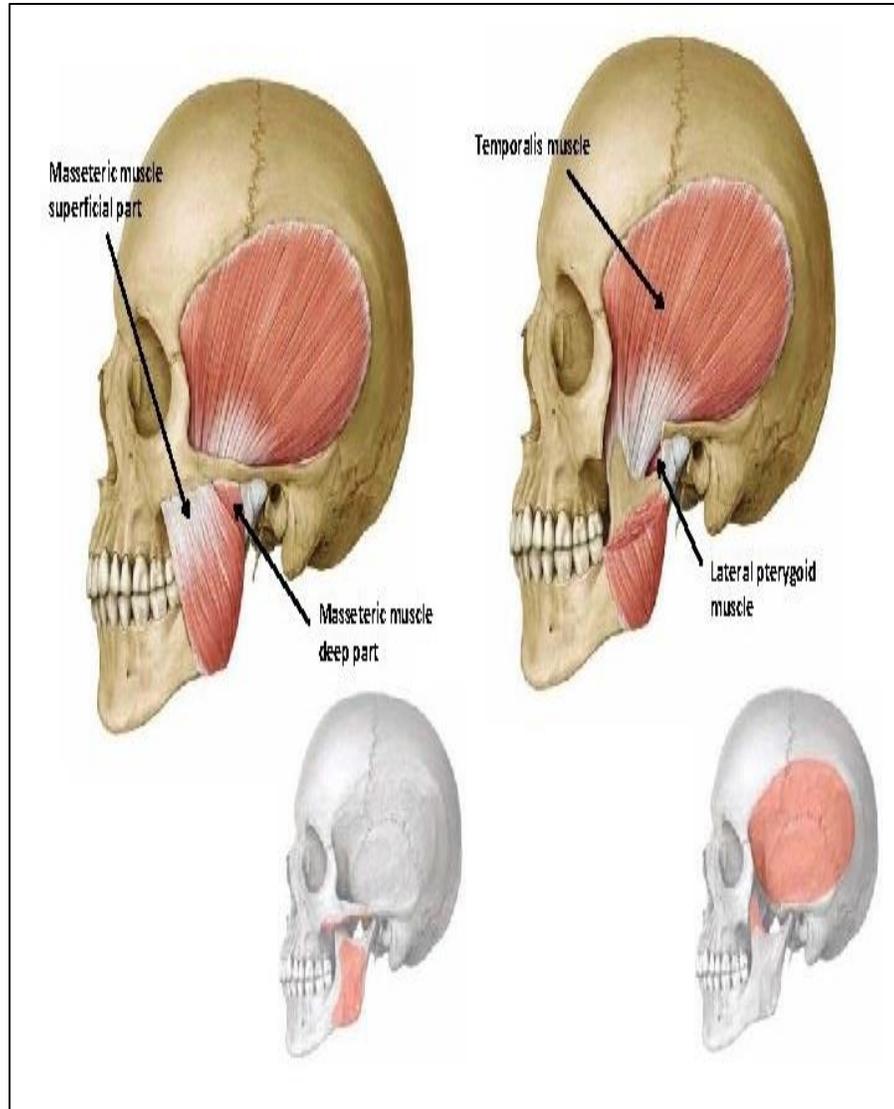


➤ **The muscle derivatives of the first arch are:**

- 1. Muscles of mastication
- 2. Anterior belly of digastric.
- 3. Mylohyoid.
- 4. Tensor palati.
- 5. Tensor tympani.

➤ The nerve of the first arch is **the mandibular nerve.**

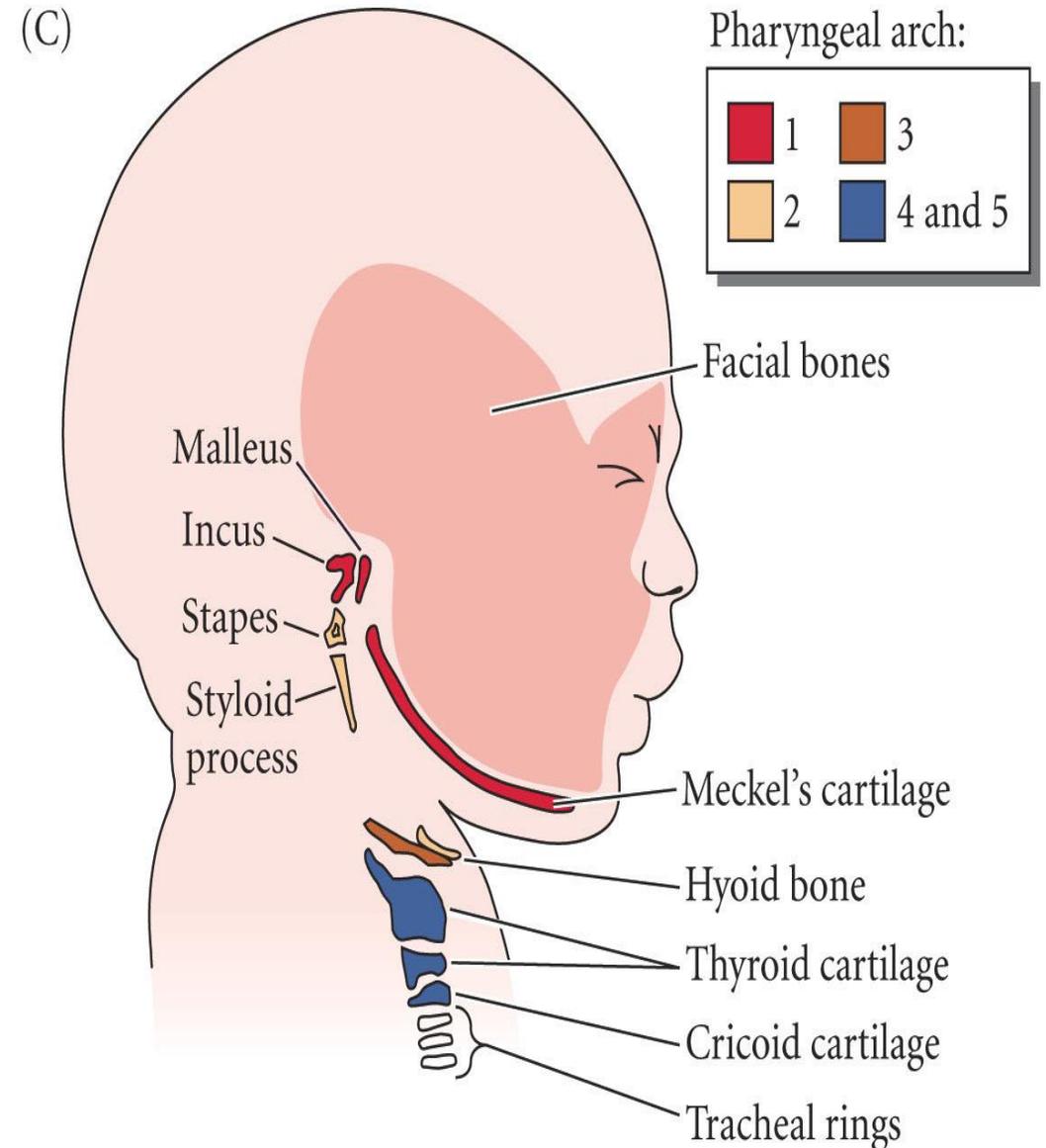
# Muscles of mastication



Second pharyngeal arch

- **The second pharyngeal (Hyoid arch):**
- **The skeletal derivatives of the second arch are:**

- 1. Stapes.
- 2. Styloid process of temporal bone.
- 3. Stylohyoid ligament
- 4. Lesser cornu and upper part of the body of the hyoid bone.

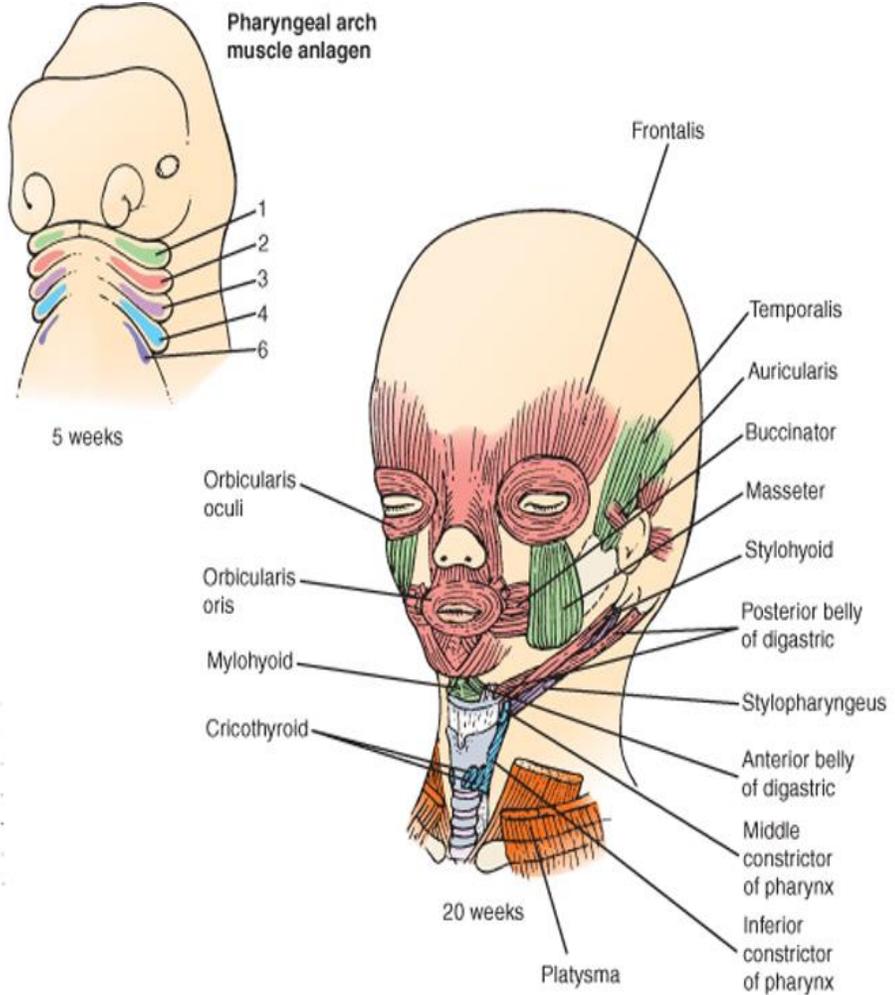
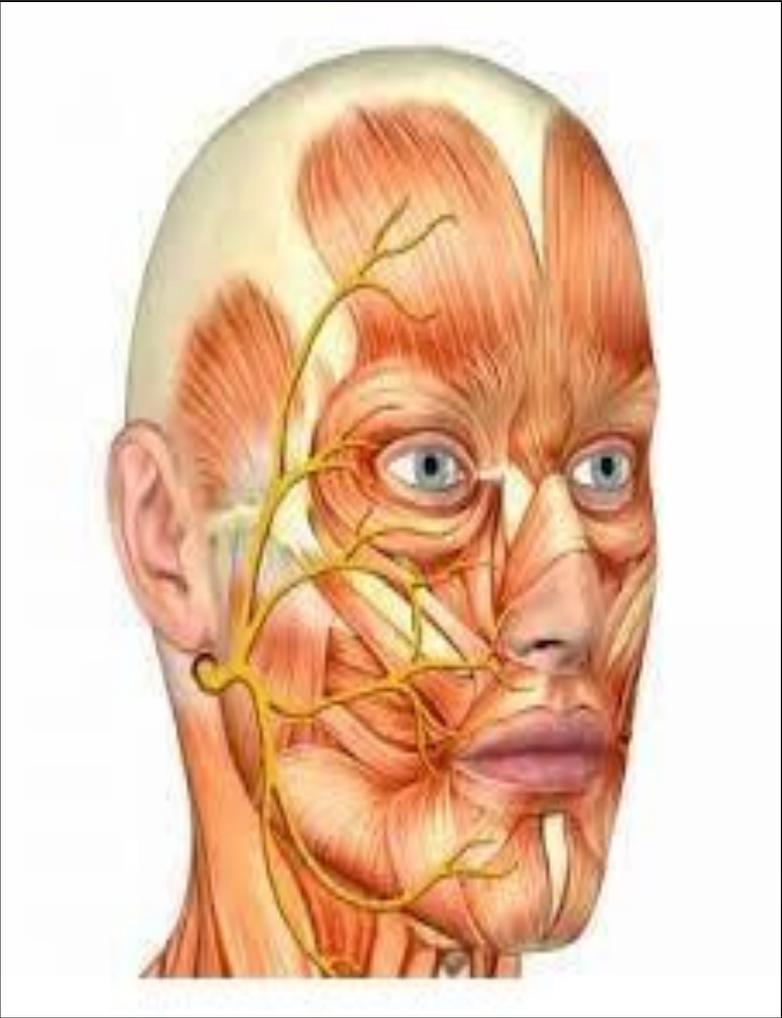


➤ **The muscle derivatives of the second arch are:**

- 1. Muscles of the face “muscles of expression” including the occipitofrontalis, muscles of the auricle and platysma.
- 2. Posterior belly of digastric.
- 3. Stylohyoid.
- 4. Stapedius of the middle ear.

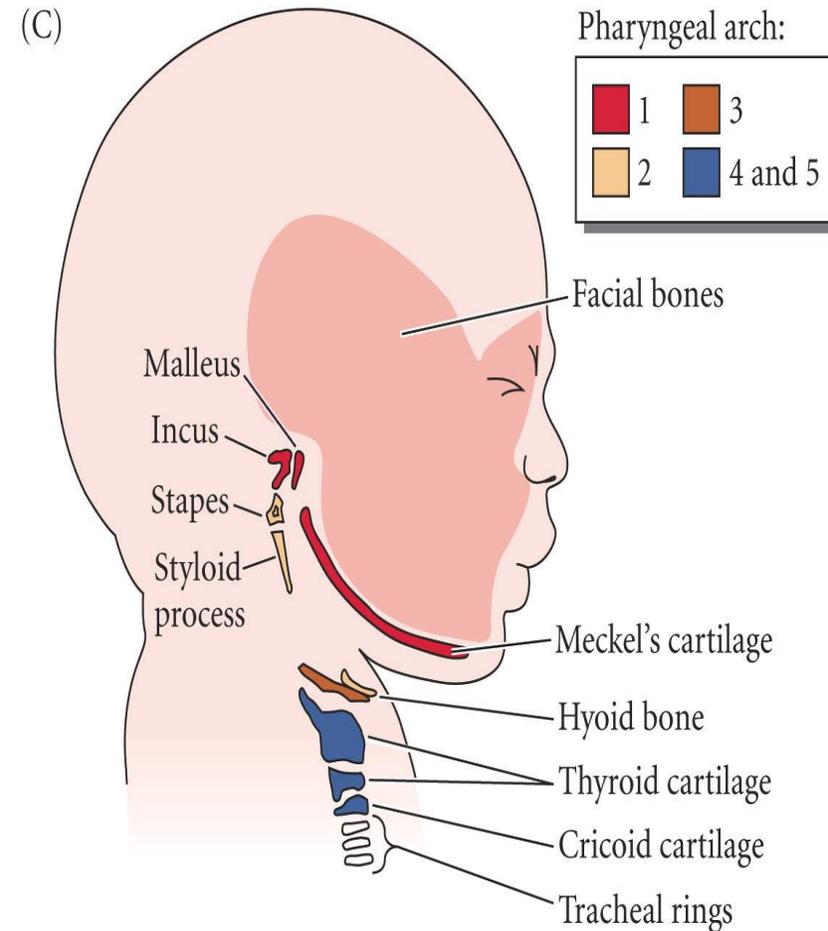
➤ The nerve of the second arch is **the facial nerve.**

# Muscles of facial expression And Facial nerve

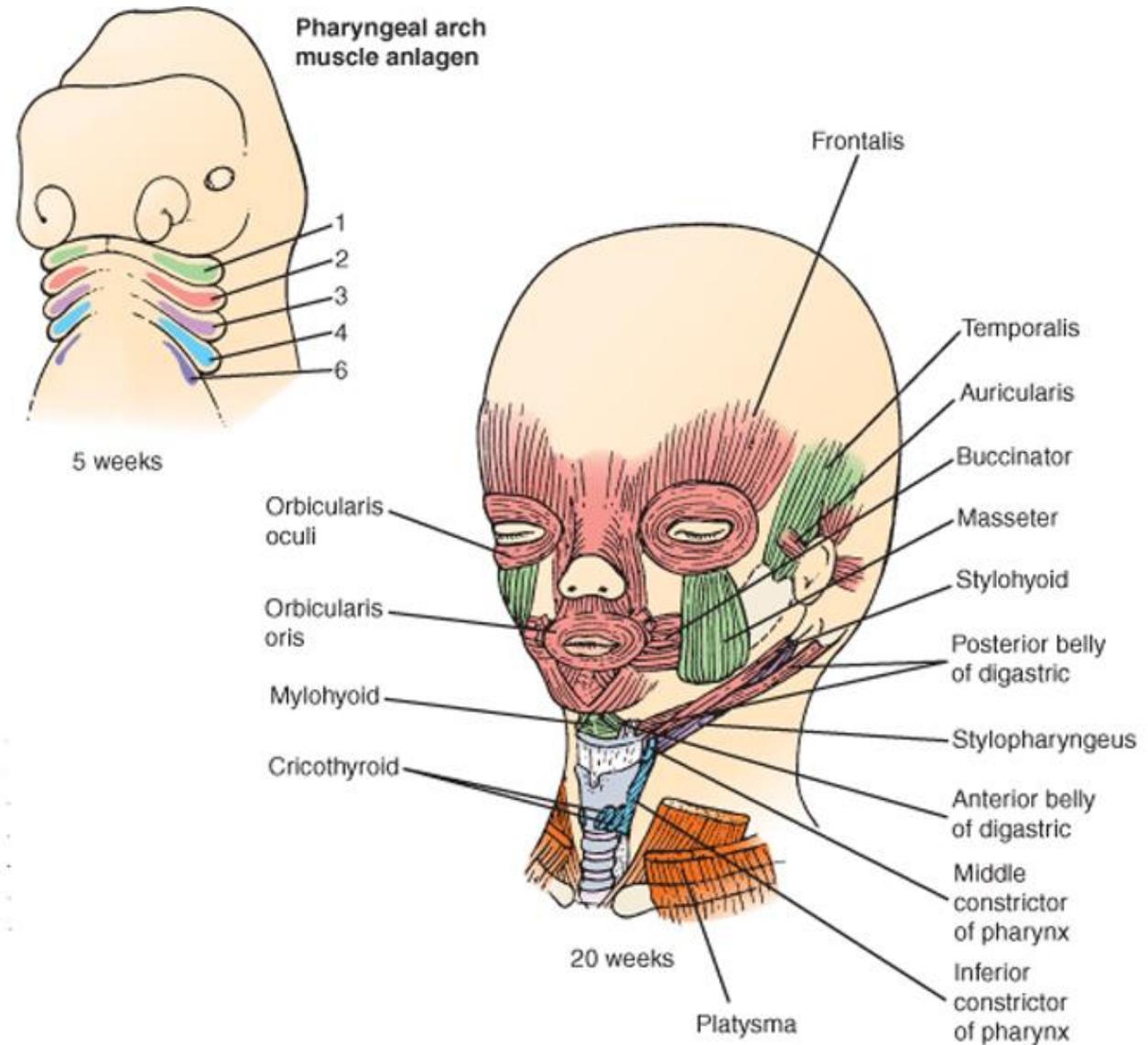


Third pharyngeal arch

- **The third pharyngeal arch:**
- Its cartilage forms the lower part of the body and the greater horn of the hyoid bone.
- The only muscle that develops from the third arch is the **stylopharyngeus**.



- The third pharyngeal arch:
- The nerve of the third arch is the **glossopharyngeal nerve**.



Fourth pharyngeal arch

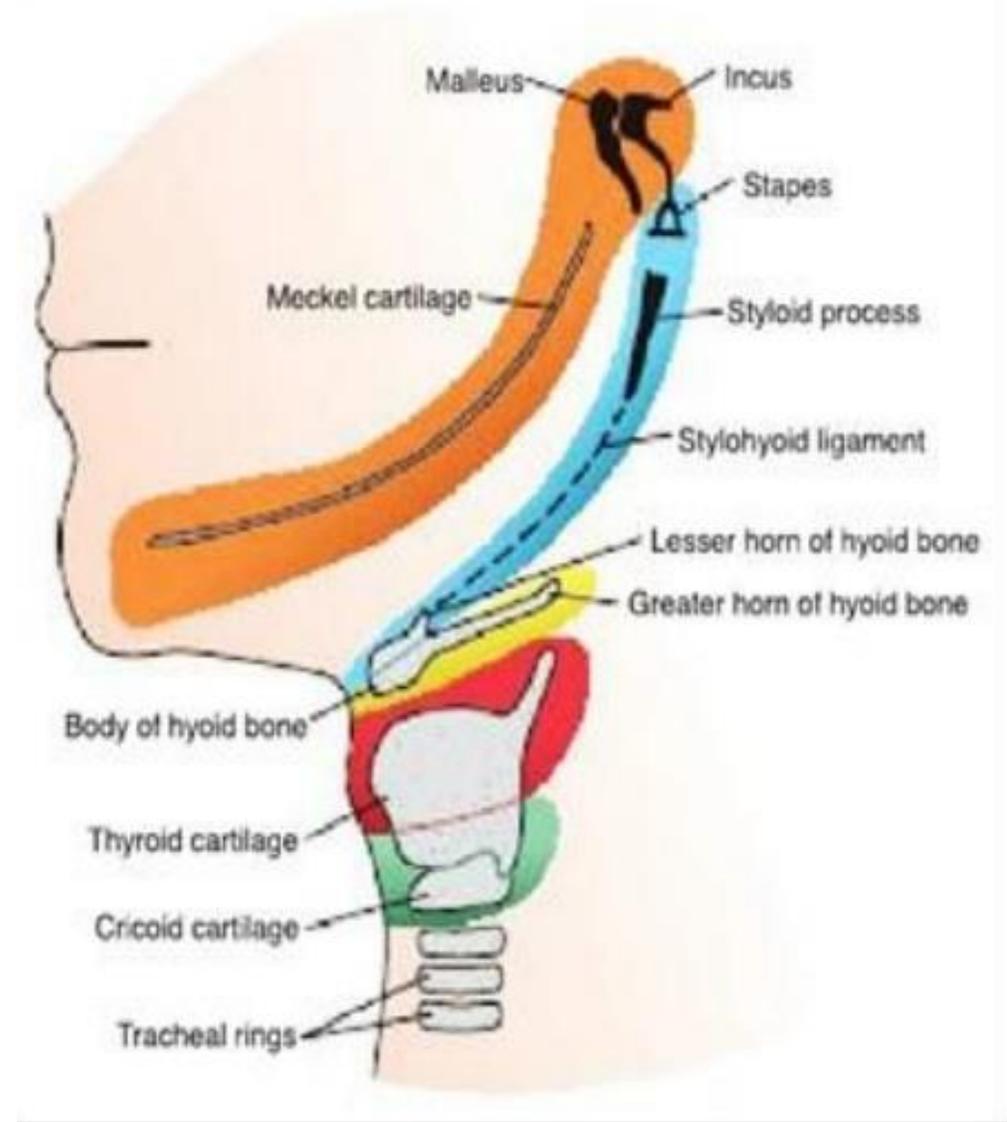
- **The fourth pharyngeal arch:**
- Its cartilage together with 6<sup>th</sup> arch forms:

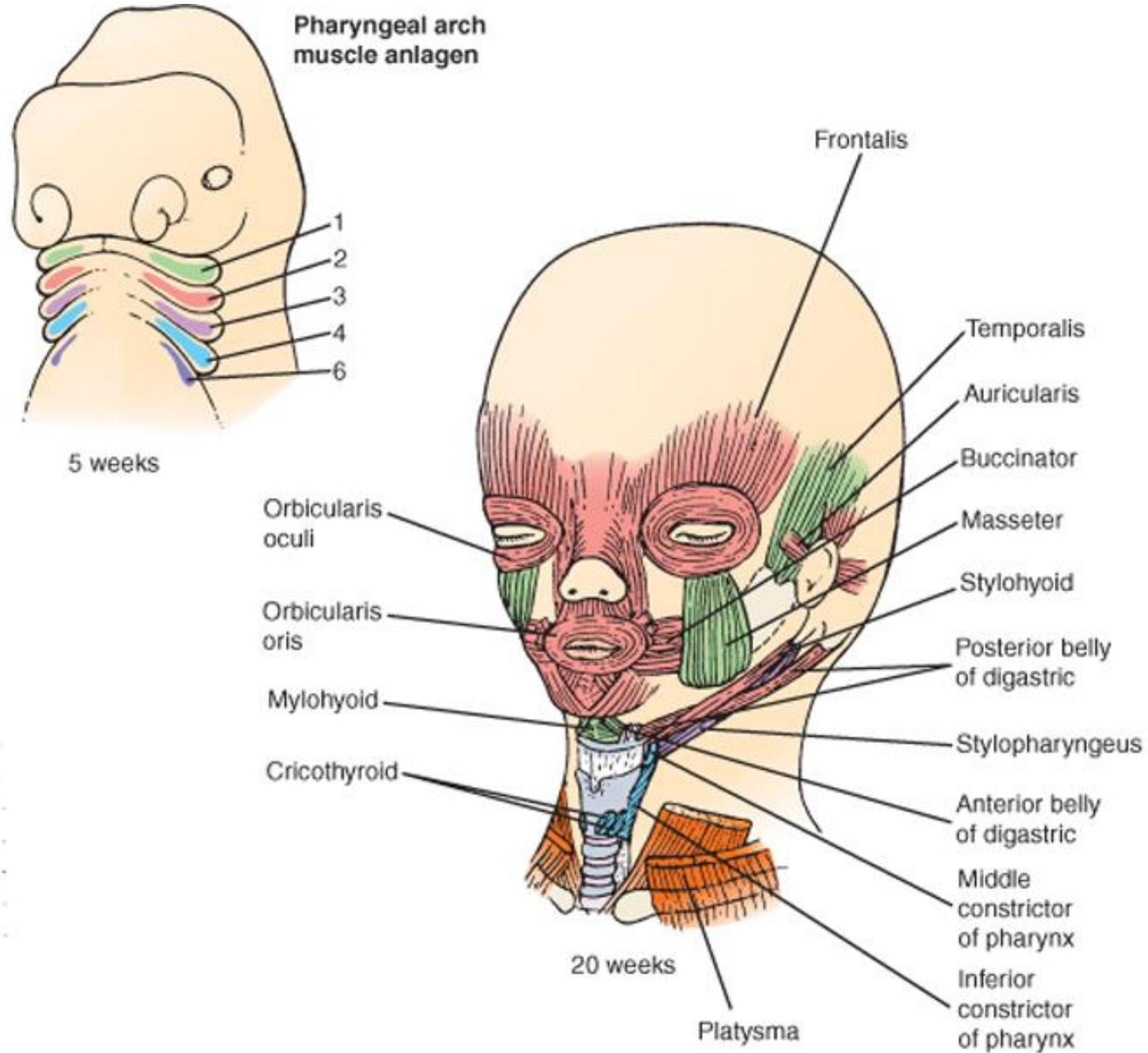
### **(the laryngeal cartilages)**

Thyroid, cricoid and arytenoid cartilages, corniculate and cuneiform cartilages.

- The muscle derived are
- **the cricothyroid.**
- **Levator palati**
- **Constrictors of the pharynx**
- The nerve supply is

**The superior laryngeal nerve.**  
**Which is a branch from vagus**





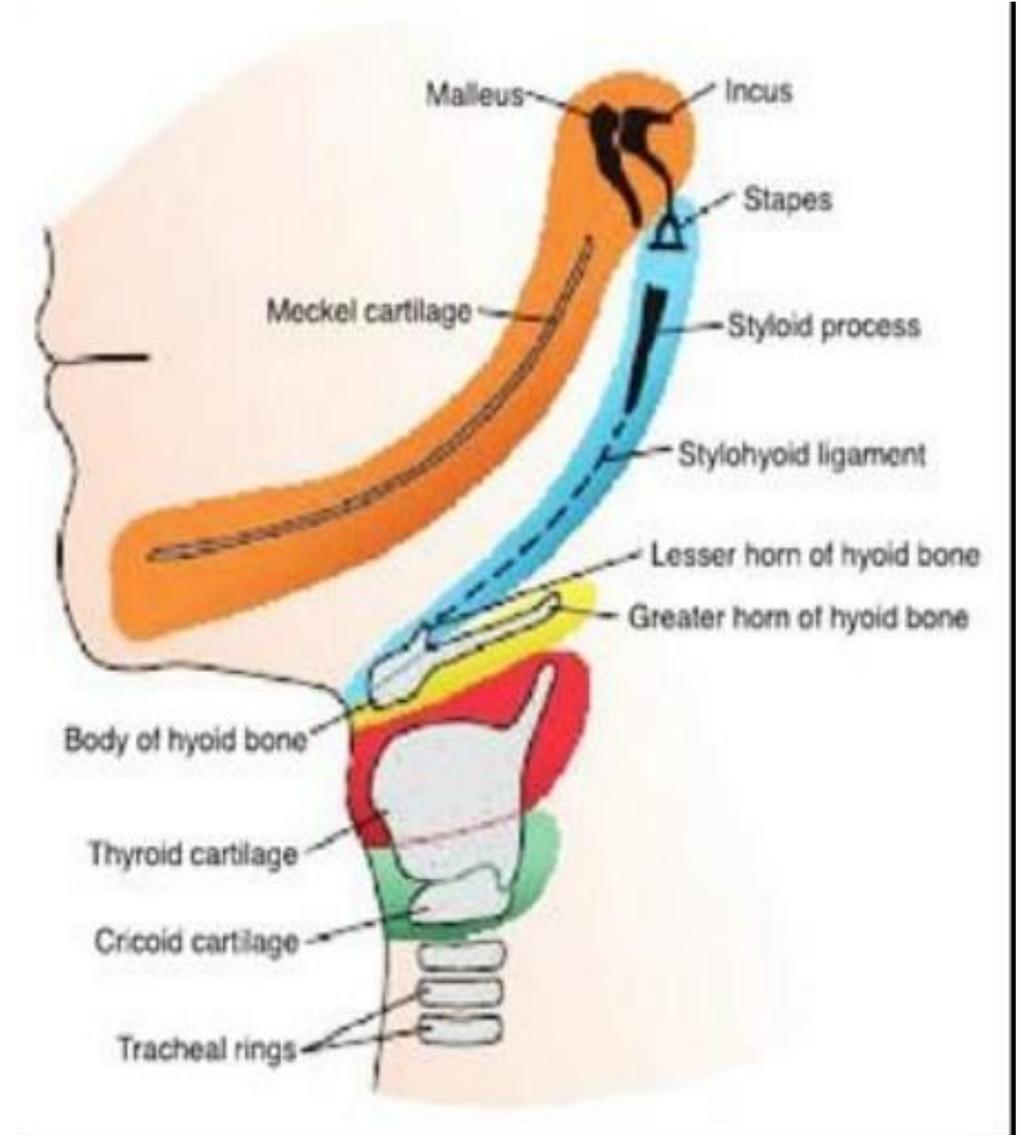
Sixth pharyngeal arch

- **The sixth pharyngeal arch:**
- Its cartilage together with 4<sup>th</sup> arch forms

### **(the laryngeal cartilages)**

thyroid, cricoid and arytenoid cartilages, corniculate and cuneiform cartilages.

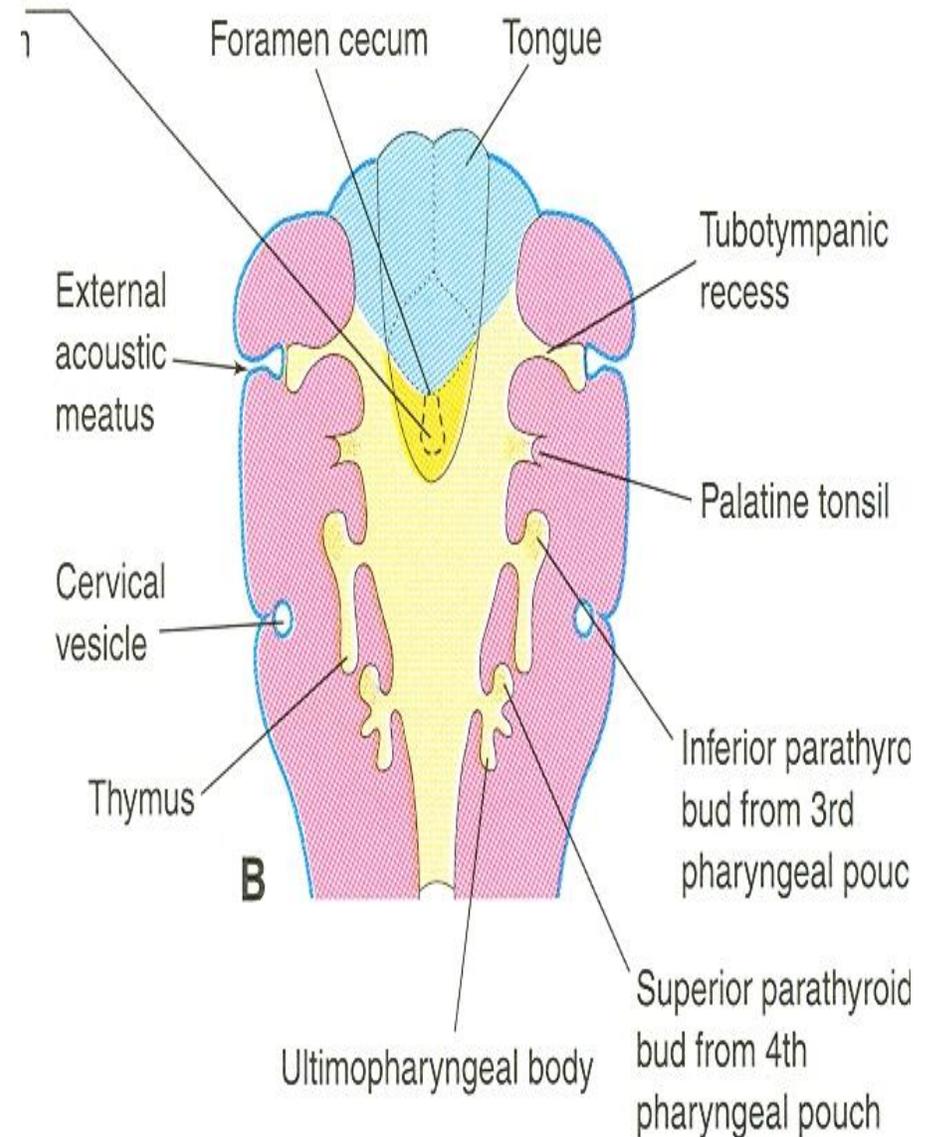
- Muscles:
- It forms the intrinsic muscle of the larynx.
- The nerve supply is the **recurrent laryngeal branch of the vagus.**

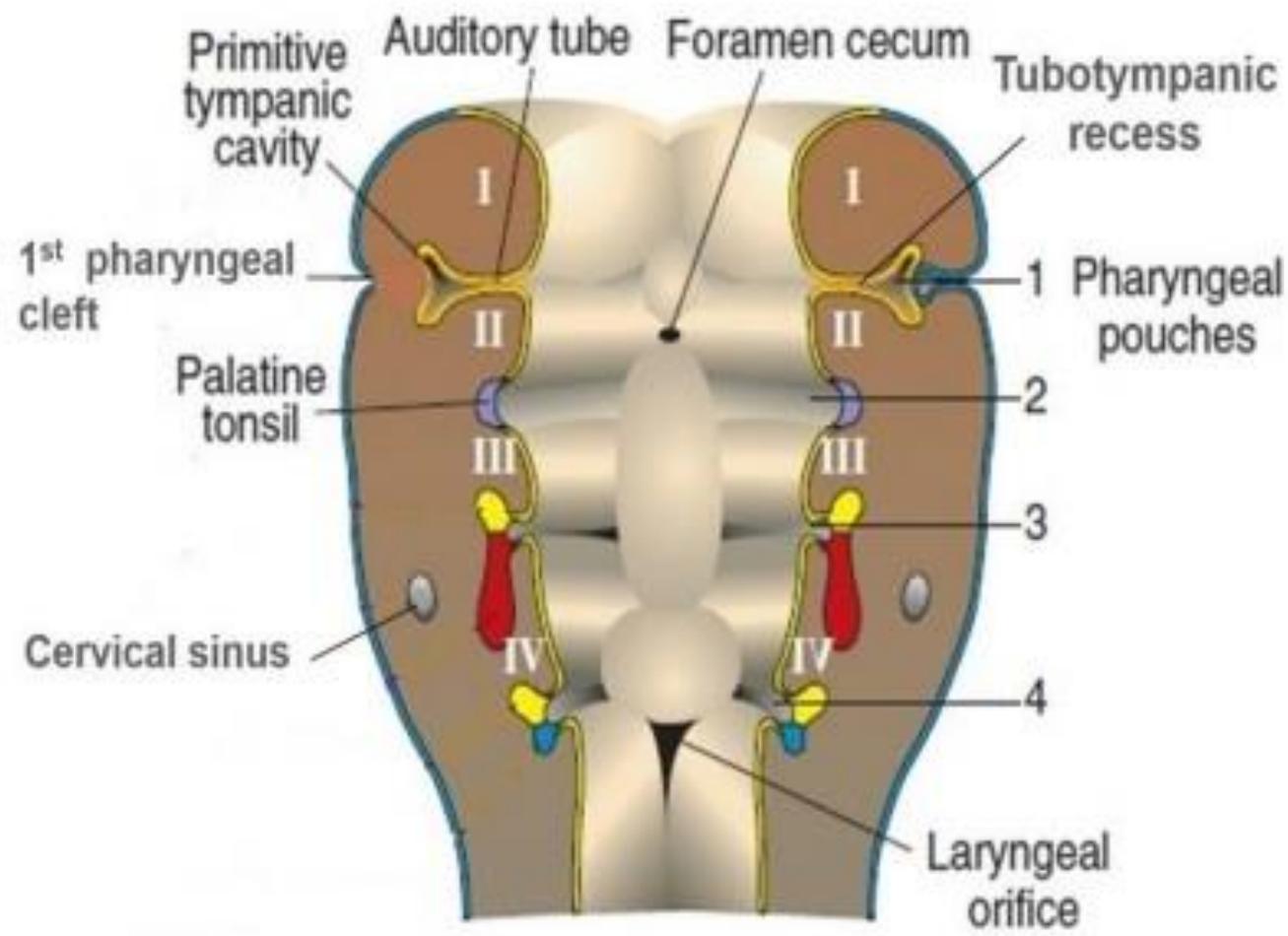


# Formation of pharyngeal pouches

# Derivatives of First Pharyngeal Pouch

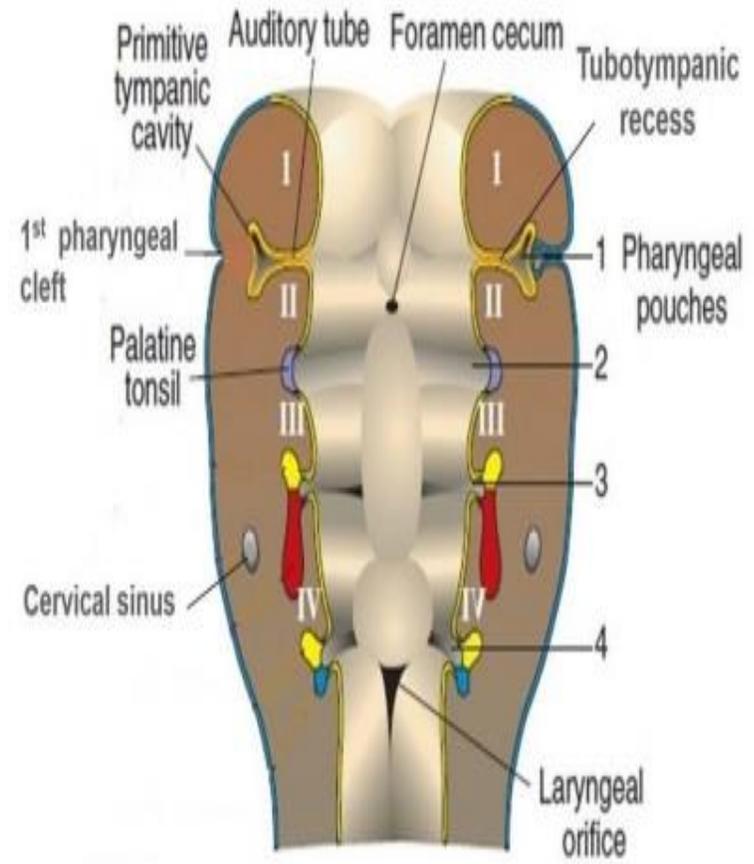
- (middle ear) cavity.
- the auditory (Eustachian) tube.
- the tympanic membrane

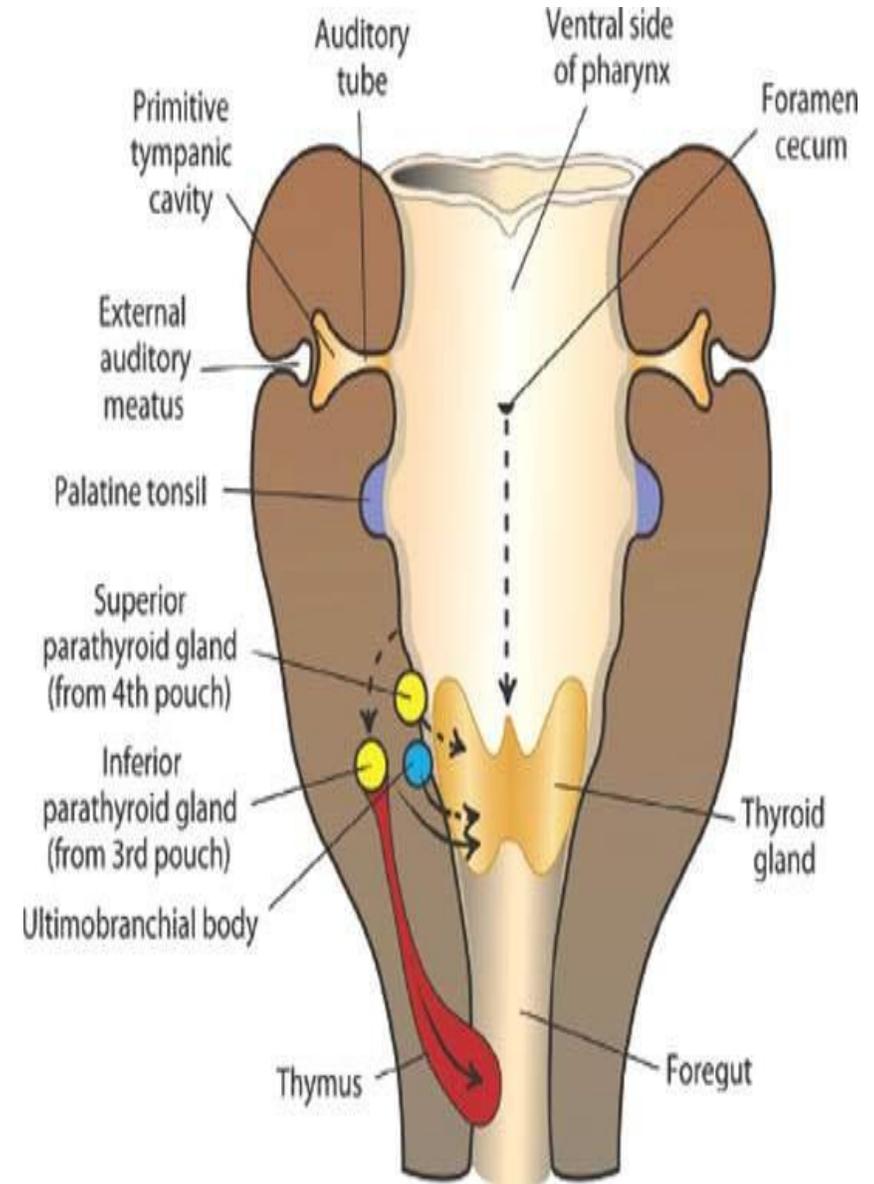
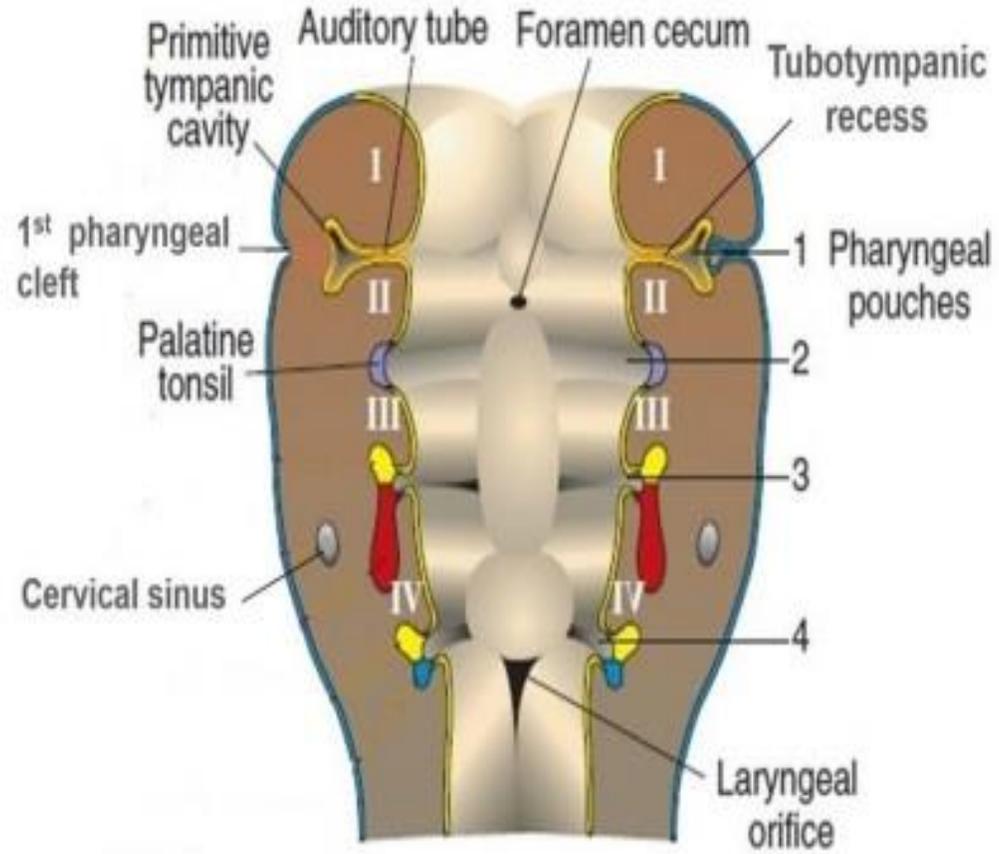




# Derivatives of Second Pharyngeal Pouch

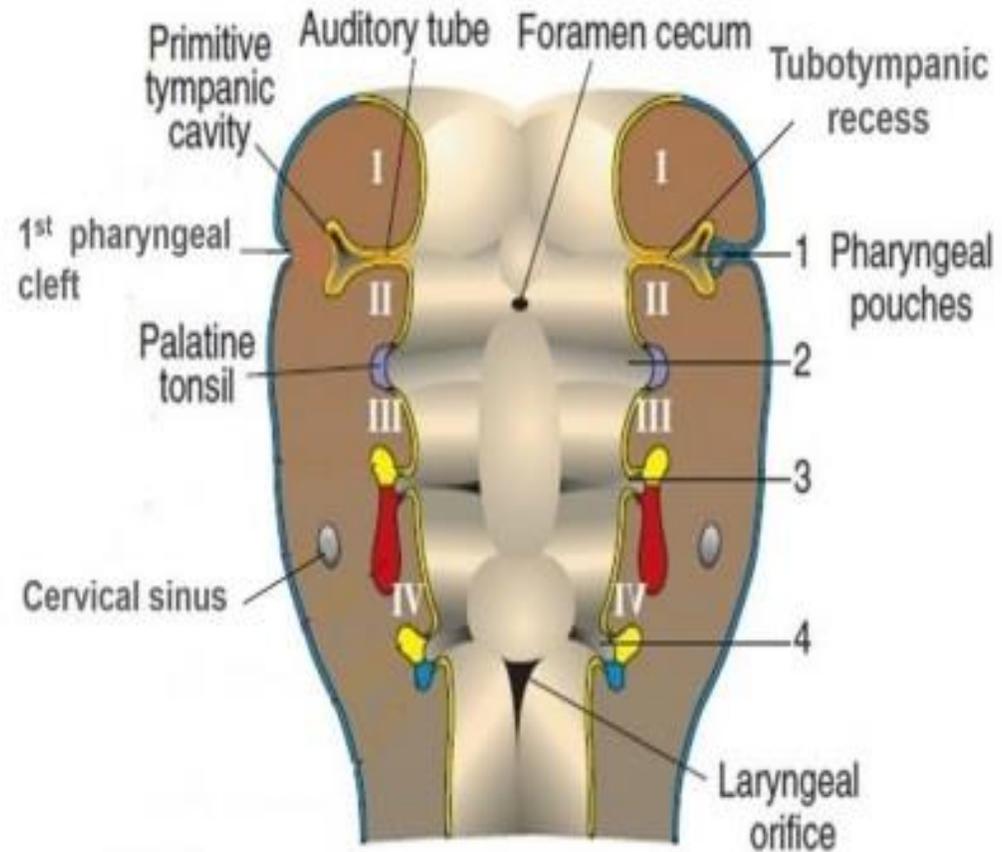
- Forms the palatine tonsils
- and tonsillar fossa.





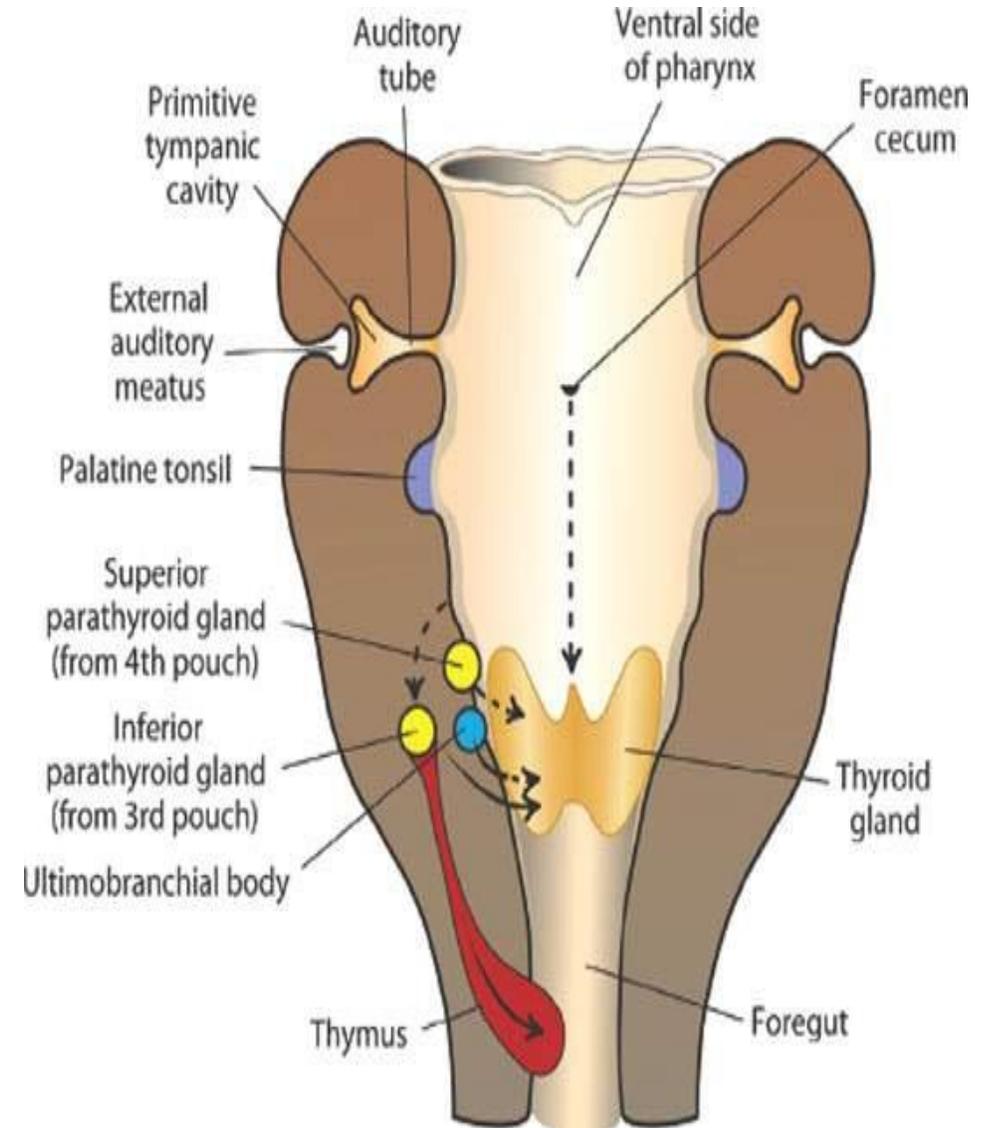
# Derivatives of Third Pharyngeal Pouch

- Dorsal wing : the inferior parathyroid gland (Parathyroid III)
- While the ventral part forms the thymus.



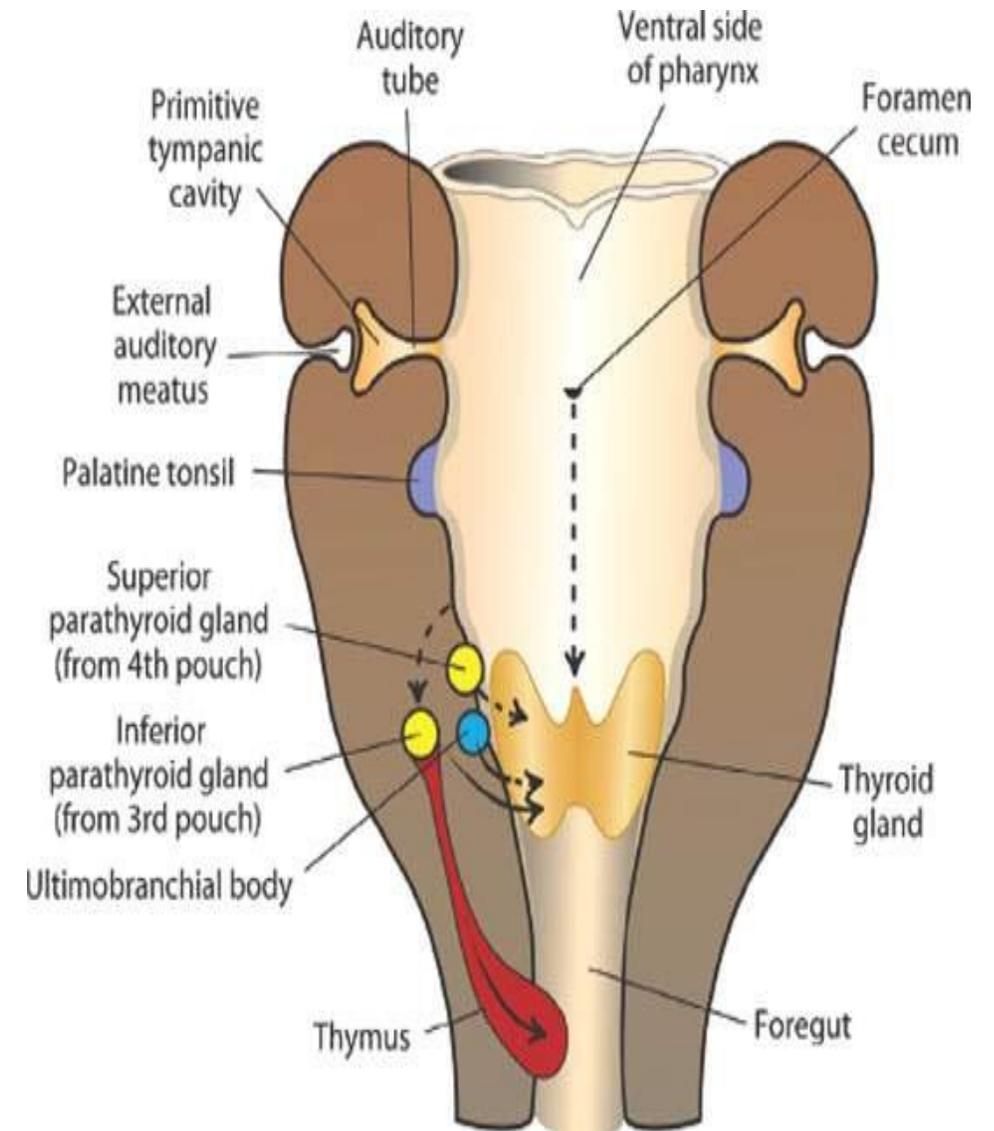
# Derivatives of Fourth Pharyngeal Pouch

- The epithelium of the dorsal wing forms the superior parathyroid gland (Parathyroid IV).
- The epithelium of the ventral wing forms the ultimobranchial body and a small amount of thymus tissue “rudimentary thymus”



## Fate:

- The **superior parathyroid** loses connection with the pharyngeal wall and migrates caudally with the thyroid gland. It becomes adherent to the posterior surface of the thyroid gland, at a higher level than the inferior parathyroid.
- The **ultimobranchial body** separates from the wall of the pharynx and becomes incorporated into the developing thyroid gland to form the parafollicular cells. Other views report that the ultimobranchial body degenerates and disappears.



## Derivatives of pharyngeal pouches

1

Middle ear cavity  
Eustachian tube of middle ear  
Tympanic membrane

2

Palatine tonsillar fossa

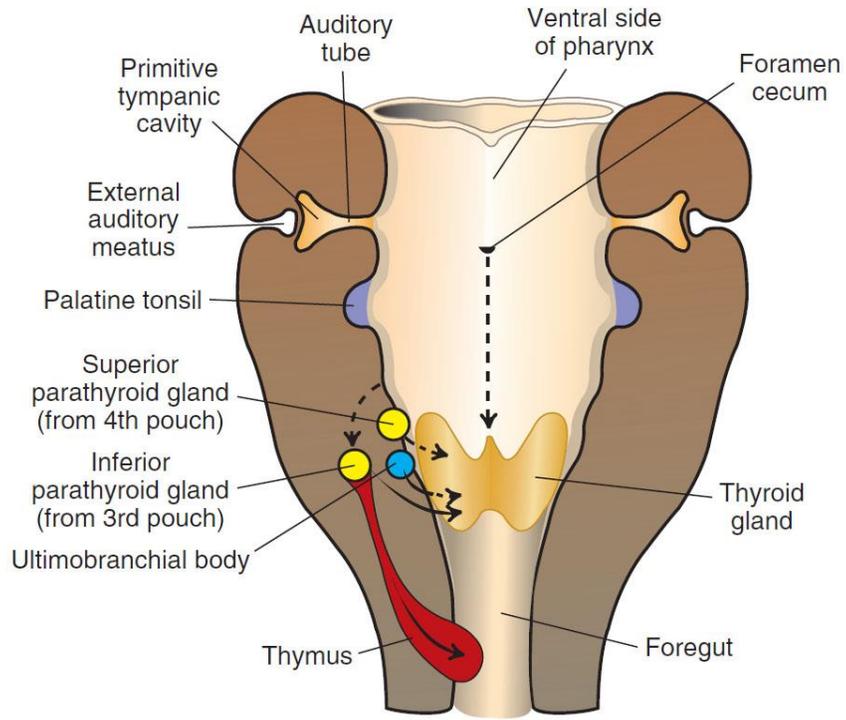
3

Dorsal: Inferior parathyroid  
Ventral: primordium of thymus

4

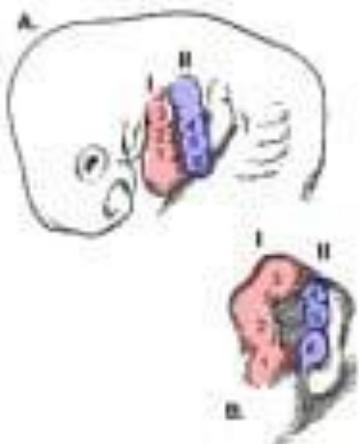
Dorsal: Superior parathyroid  
Ventral: - Ultimobranchial body incorporated into the thyroid for a while, but eventually is completely degenerates  
- rudimentary thymus (soon disappears)

pharyngeal clefts



# Pharyngeal Clefts

- In the 5<sup>th</sup> week, 4 ectodermal grooves are seen between the arches. These are called the pharyngeal clefts.
- The dorsal part of the 1st cleft penetrates the underlying mesenchyme to form **the external auditory meatus**. The ectodermal lining of the meatus forms the outer layer of the tympanic membrane.
- Around the developing meatus, the pinna is formed as a result of the growth and fusion of 6 small surface elevations
  - 3 derived from the 1st arch
  - 3 from the 2nd arch.



# Pharyngeal Clefts

- **The remaining clefts become buried by the 2nd pharyngeal arch, which enlarges and grows inferiorly in the neck.**
- **As a result of this, the 2nd, 3rd 4th clefts form the floor of a cavity lined with ectoderm called the cervical sinus.**
- **Later the sinus becomes obliterated by fusion of its walls.**



THANK YOU